

**IV. Remarks****A. Objection to the Abstract**

The Action objects to the wording of the Abstract and for reciting more than 150 words. An amended Abstract is submitted herewith by separate Abstract sheet.

**B. Claim Amendments**

Claim 1 has been amended to define that the X-ray picture contains a picture of an artificial reference specimen, which results from x-raying the artificial reference specimen as it is disposed beside a mandible so that it appears in the X-ray picture beside the picture of the mandible. The artificial reference specimen is different from a portion of a sample, i.e. the mandible, to be examined or evaluated, and this reference specimen is x-rayed together with the mandible in such a manner that the picture of the artificial reference specimen is disposed beside the picture of the mandible in the X-ray picture. This feature is supported by, for example, the disclosure in Paragraph [0025], [0026] and [0102] of the specification. Claim 1 is also amended to refer to the standard value as a “preset standard value” to better recite this feature. Similar amendments have been made to independent claim 12.

The Action rejects claim 13 as lacking antecedent basis for “said standard value.” Claim 13 has been amended to refer to “said standard average and said standard deviation” as recited in claim 12. Reconsideration and withdrawal of this rejection are respectfully requested.

Claims 10 and 17 are amended to change “evaluation means” to “evaluating means” consistent with the reference to “evaluating means” in the claims from which they depend.

**C. Claim Rejection under 35 U.S.C. § 103**

The Action rejects claims 1 and 6-10 as being obvious from Choel et al. (“Trabecular alveolar bone in the human mandible: A dual energy x-ray absorptiometry study”) in view of U.S. Published Patent Application No. 2001/0021269 to Inoue.

As now recited in amended claim 1, the X-ray picture contains a picture of a mandible (i.e., the object to be examined) and a picture of an artificial reference specimen separate from the object or mandible. The artificial reference specimen is positioned such that the picture of the artificial reference specimen in the X-ray picture is positioned beside the picture of the mandible. The gradation of a particular portion of the picture of the artificial reference specimen in the X-ray picture is detected by detecting means. Further, the gradation of the entire X-ray picture is corrected by correcting means in such a manner that the gradation of the particular portion of the artificial reference specimen as detected by the detecting means complies with a preset standard value. Evaluating means evaluates a bone mineral density from the corrected gradation of a particular region of the picture of the mandible in the gradation-corrected X-ray picture, or, more specifically, from the corrected gradation of a region corresponding to an alveolar bone portion around the first premolar.

It is known that the bone mineral density of a whole human body can be evaluated based on a gradation of an X-ray picture of a mandible. According to the invention of claim 1, an artificial reference specimen is used to facilitate quantitative evaluation of bone mineral density. The "artificial" reference specimen is used because its properties, such as material, a shape and/or dimensions, are known. The gradation of an X-ray picture of a mandible (or any other object) may vary depending on various conditions including an x-raying condition. Then, in order to make it possible to quantitatively evaluate the bone mineral density of a whole body from the gradation of such X-ray picture of a mandible, it is necessary to correct or normalize the gradation of the entire X-ray picture (or, more specifically, the gradation of at least a particular region of the picture of the mandible subject to the evaluation) in relation to a predetermined reference provided by the artificial reference specimen. According to claim 1, the gradation of the entire X-ray picture containing a particular portion of the picture of the artificial reference specimen is corrected to make the gradation of the particular portion of the artificial reference specimen equal to a preset standard value, whereby the gradation of the X-ray picture as a whole is corrected. Then, the bone mineral density of the patient is evaluated based on the gradation of the particular region of the picture of the mandible (i.e., the object to be examined) in the

gradation-corrected X-ray picture. In this manner, quantitative evaluation of the bone mineral density is realized.

In the Action, the Examiner, cites to Choel et al. Figure 2, Page 365 for teaching the claimed “detecting means”: “The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray. Moreover, x-ray pictures have gradation level- black and white.” However, the “three regions of interest- G, R1 and R2” referred to by Choel et al. are the particular regions of the “three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS)” which are subject to examination, not a particular portion of an artificial reference specimen subjected to detection by the detecting means recited in claim 1 of the present application. Put another way, the three regions of interest - G, R1 and R2 – correspond to the particular region of a mandible recited in claim 1 that are being evaluated, not to an artificial reference specimen that is used in detection of gradation and then used in correcting the gradation of the X-ray picture as claimed. The regions of Choel et al. are indefinite, i.e., do not have known properties. Choel et al. neither discloses nor suggests an artificial reference specimen nor employing such an artificial reference specimen as an index for use in correcting the gradation.

The Action concedes that Choel et al. does not disclose the claimed “correcting means”. But the Examiner relies on the combination of Choel and Inoue for providing a bone mineral density evaluation system having this feature. Inoue discloses an image processing apparatus which utilizes histogram equalizing processing to make an X-ray picture of a specific field of a human body more easily observable by an observer (i.e., more human readable) (see Paragraphs [0046]-[0057] and [0067] and [0077]-[0078]). The invention of Inoue has no relation to quantitatively evaluating bone mineral density of an entire human body from the gradation of an X-ray picture of a mandible of that human. One of ordinary skill in the art would not look to techniques for making an X-ray image more observable to a human observer in correcting X-ray images so that they are usable by bone evaluation means for evaluating bone mineral density.

Moreover, combining Inoue with Choel et al. would be a more human readable X-ray picture of a mandible that is subject to examination. It may be possible to evaluate, through sense, or qualitatively, the bone mineral density from such X-ray picture of a mandible, but it is not possible to make quantitative evaluation of the bone mineral density by the human eye. Correction for making an X-ray picture more human readable as taught by Inoue does not result in an X-ray picture corrected with respect to a preset standard value as claimed such that bone mineral density can be qualitatively determined by an evaluation means. Therefore, not only would one of ordinary skill in the art not look modify the teachings of Choel et al. based on techniques for making X-ray image more human readable, but the resultant combination would not provide the claimed correcting means for correcting the gradation to comply with a preset standard value appropriate for bone mineral density evaluations.

For at least these reasons, Applicant submits that claim 1 is not obvious from combination of Choel et al. and/or Inoue, and is fully patentable. Claims 6-10 dependent from Claim 1 are also patentable.

The Action rejects claims 12-14 and 16-17 as being obvious from Choel et al. in view of Kim. The Action rejects claim 15 as being obvious from Choel et al. in view of Kim and in further view of Inoue. Claim 12 has been amended in a manner analogous to amended claim 1.

As discussed above in connection with claim 1, Choel et al. neither teaches nor suggests an artificial reference specimen nor employing such an artificial reference specimen as an index for use in correcting the gradation of an X-ray image.

The Examiner concedes that Choel et al. does not disclose the claimed detecting means or the correcting means of claim 12. The Examiner relies on Kim for providing these features and finds that it would have been obvious to combine Choel et al. and Kim.

Kim's invention relates to image quality enhancement. But Kim neither discloses nor suggests use of an index for use in gradation correction as claimed, like the artificial reference specimen as recited in the amended Claim 12. Application of Kim's contrast enhancer, on which

the Examiner relies in the Action, would simply enhance the picture quality of Choel et al.'s X-ray picture of a mandible under examination. But the enhanced image would not be an image corrected to comply with a preset standard average and a preset standard deviation as claimed that relates to gradations preset for evaluating bone mineral density. Processing an image for better human evaluation is not the claimed correction of gradation to preset standard average and standard deviation that are preset for performing qualitative bone mineral density evaluations by machine, not humans. Therefore, not only would one of ordinary skill in the art not look to incorporate Kim's qualitative image improvement techniques into Choel et al., but the combination would not result in the claimed "correcting means for correcting the gradation of said X-ray picture so as to make the average and the deviation as detected by said detecting means comply with a preset standard average and a preset standard deviation."

Applicant respectfully submits that claim 12 and claims 13-17, which depend from claim 12, are not obvious from and are allowable over the cited references.

#### **D. New Claims**

Claims 18-23 have been added. Support for these claims can be found in, for example, Paragraphs [0025], [0026] and [0102] of the application as filed. Examination and allowance of these claims are respectfully requested.

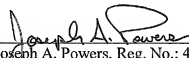
**V. Conclusion**

In view of the foregoing remarks and amendments, Applicant submits that this application is in condition for allowance at an early date, which action is earnestly solicited.

The Commissioner for Patents is hereby authorized to charge any additional fees or credit any excess payment that may be associated with this communication to deposit account **04-1679**.

Respectfully submitted,

Dated: September 21, 2010

  
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Joseph A. Powers, Reg. No.: 47,006  
Attorney For Applicant

DUANE MORRIS LLP  
30 South 17<sup>th</sup> Street  
Philadelphia, Pennsylvania 19103-4196  
(215) 979-1842 (Telephone)  
(215) 979-1020 (Fax)